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# Analysis of Flight Parameters to Derive Load Spectrum Sequence for Full Scale Fatigue Testing of an Ageing Aircraft

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## Abstract

*In order to extend the fatigue life of an aging fleet of aircraft, a full scale air frame fatigue test is conducted on a representative airframe in the laboratory. For simulating the service loads on the airframe, a spectrum load sequence has to be derived from the flight parameters recorded in the flight data recording (FDR) system. The data recorded on a magnetic tape is transferred to digital format through an interface along with other parameters that are entered by the pilot, such as weight of aircraft, stores carried, type of sortie, etc. The recorded data has to be "cleaned up" to eliminate electronic disturbance, tape related problems and intermittent data points.*

*The noise elimination is solely dependent on experience one has developed after looking at the various continuous parameters like Fuel Remainder, Vertical Acceleration ($g_y$), Indicated Air Speed, Mach Number, Barometric Altitude, etc. The permissible minimum and maximum variations within a second, for each of the parameters form the basis for the elimination of noisy data points. The FDR data has an advantage of recording all the parameters synchronously at an equal interval of one second. Hence the vectors of $g_y$ and fuel remainder together with take off weight, as recorded by the pilot, can be used to obtain loads taking into account fuel consumption and the stores carried during the sortie.*

*A computer code has been developed for filtering spurious amplitudes/ excursions due to noise recorded on the tape. The '$g_y$' is the acceleration normal to flight direction, while '$g_x$' and '$g_z$' are longitudinal and lateral accelerations; data from a large number of FDR files are then arranged randomly, flight by flight, from which number of exceedings of various 'g' levels were counted to arrive at a 'g'-exceedance curve that is representative of the service load history for the fighter aircraft. Finally, a representative spectrum load sequence was derived through analysis of all these flight parameters, for full scale fatigue testing in the laboratory.*

(Full paper not available)

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